

Translation

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 185/WO/1	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP00/05376	International filing date (day/month/year) 10 June 2000 (10.06.00)	Priority date (day/month/year) 29 June 1999 (29.06.99)
International Patent Classification (IPC) or national classification and IPC H01M 4/24, 4/98, 4/38, 4/62		
Applicant DEUTSCHE AUTOMOBILGESELLSCHAFT MBH		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of <u>7</u> sheets, including this cover sheet.  <input type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  These annexes consist of a total of _____ sheets.
3. This report contains indications relating to the following items:  I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input checked="" type="checkbox"/> Certain defects in the international application VIII <input checked="" type="checkbox"/> Certain observations on the international application

Date of submission of the demand 15 January 2001 (15.01.01)	Date of completion of this report 08 February 2001 (08.02.2001)
Name and mailing address of the IPEA/EP	Authorized officer
Facsimile No.	Telephone No.

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/EP00/05376

## I. Basis of the report

1. This report has been drawn on the basis of *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.)*:

- ☐ the international application as originally filed.
- ☒ the description, pages 1-6, as originally filed,  
 pages \_\_\_\_\_, filed with the demand,  
 pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_,  
 pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_.
- ☒ the claims, Nos. 1-17, as originally filed,  
 Nos. \_\_\_\_\_, as amended under Article 19,  
 Nos. \_\_\_\_\_, filed with the demand,  
 Nos. \_\_\_\_\_, filed with the letter of \_\_\_\_\_,  
 Nos. \_\_\_\_\_, filed with the letter of \_\_\_\_\_.
- ☒ the drawings, sheets/fig 1/1, as originally filed,  
 sheets/fig \_\_\_\_\_, filed with the demand,  
 sheets/fig \_\_\_\_\_, filed with the letter of \_\_\_\_\_,  
 sheets/fig \_\_\_\_\_, filed with the letter of \_\_\_\_\_.

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/fig \_\_\_\_\_

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

4. Additional observations, if necessary:

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/EP 00/05376

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

## 1. Statement

Novelty (N)	Claims	1-17	YES
	Claims		NO
Inventive step (IS)	Claims	1-17	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-17	YES
	Claims		NO

## 2. Citations and explanations

1. Prior art documents

D1: EP-A-0 735 093

D2: EP-A-0 277 332

D3: US-A-5 682 592

D4: Chemical Abstracts and Indexes, US, American  
Chemical Society, Columbus, Ohio, US, Vol. 119  
(1993), Abstract No. 52967r  
& JP-A-05 089 877

2. Novelty

The claimed subject matter is a novel selection of features with respect to document D1 (closest prior art).

In general terms, D1 describes a method for producing (positive and negative) electrodes containing an active material, fibrillating polytetrafluoroethylene (PTFE) as an organic binder, a conductivity-enhancing medium, and optionally a dispersing agent. The electrode material is obtained from the constituents by mixing (kneading and extrusion) and is applied to a metal substrate. In addition to all the commonly used positive electrode materials (such as  $\text{LiCoO}_2$ ,  $\text{LiNiO}_2$ ,

lithium manganese oxides, lithium vanadium oxides,  $\text{MnO}_2$ ,  $\text{ZnO}$ ,  $\text{Ni}(\text{OH})_2$ , carbon fluoride and  $\text{CuO}$ ) and negative electrode materials (such as metallic lithium and alloys thereof,  $\text{Zn}$ ,  $\text{Cd}(\text{OH})_2$ , lithium-absorbing carbon and carbon blacks), D1 also mentions hydrogen storage alloys as possible active electrode materials.

The organic binder in D1 is an aqueous or non-aqueous dispersion of core-shell composite particles, consisting of a core of fibrillating PTFE and a shell of non-fibrillating fluorinated polymer ( $\text{VdF}$ ,  $\text{TFE}$ ,  $\text{CTFE}$ ). In the case of a non-aqueous dispersion, an alcohol such as isopropanol can be used as the dispersing and wetting agent for the PTFE particles (bottom of page 4). It is therefore clear that D1 uses a dispersion of PTFE particles in an organic dispersing agent which may contain alcohol, whereas the present invention starts with solid PTFE powder which is wetted with an aqueous-alcoholic phase during processing.

Active carbon, carbon black, acetylene carbon black, graphite and conductive polymers (e.g. polyaniline) are mentioned as conductive media.

D1 does not provide a specific example of a hydrogen storage electrode containing PTFE, carbon black and a  $\text{C}_3\text{-C}_6$  alcohol as a dispersing agent.

To arrive at the subject matter of the present application therefore requires a deliberate and specific selection from among the various equivalent alternatives described in D1 for the active electrode substances, dispersing and wetting agents and conductive substances.

The claimed electrode is not known from any of the other cited documents.

Document D2 discloses a hydrogen storage electrode made of Raney nickel and fibrillating PTFE by intensive kneading and rolling. The electrode does not contain carbon black or a C<sub>3</sub>-C<sub>6</sub> alcohol as a dispersing agent.

Document D3 discloses a paste-like metal hydride electrode for nickel/metal hydride batteries. The electrode is obtained from a mixture of a powdered composition metal, 1-10% Ketjen Black (or nickel powder), 1-20% (preferably 10%) PTFE, and 2% hydroxypropyl methyl cellulose (see Example 1). It does not include a C<sub>3</sub>-C<sub>6</sub> alcohol or a comparable substance as a dispersing or wetting agent for the PTFE. It may be assumed that the use of C<sub>3</sub>-C<sub>6</sub> alcohols in the manufacturing process, as per the present invention, causes a different and improved dispersion and fibrillation of the PTFE in the electrode material, such that the finished and dried electrode (after evaporation of the C<sub>3</sub>-C<sub>6</sub> alcohol) is different from the electrode obtainable by the process according to D3.

Document D4 discloses a hydrogen storage electrode made of an active hydrogen storage material, an organic binder (polyvinyl alcohol) and carbon black.

Claim 1 therefore meets the requirement of PCT Article 33(2) (novelty).

The same applies to product Claims 2-7 (which refer back to Claim 1) and also to the claimed processes for manufacturing the claimed electrode (Claims 8-16) and to the claimed use of the novel electrode (Claim 17).

3. Inventive step

Although D1 does mention (see bottom of page 4) the wetting action of organic solvents such as isopropanol on finely dispersed PTFE, the main emphasis appears to be on the use of their dispersing action to obtain a stable organosol. This cursory reference is not enough to prompt a person skilled in the art to use aqueous C<sub>1</sub>-C<sub>3</sub> alcohols in conjunction with solid PTFE powder.

Thus, since none of the relevant documents proposes a binder consisting of solid PTFE which is wetted during processing by an aqueous-alcoholic phase containing C<sub>1</sub>-C<sub>3</sub> alcohols, the claimed subject matter can also be acknowledged as inventive.

The same applies to product Claims 2-7 (which refer back to Claim 1) and also to the claimed process for manufacturing the claimed electrode (Claims 8-16) and to the claimed use of the novel electrode (Claim 17).

The application therefore meets the requirement of PCT Article 33(3) (inventive step).

4. Industrial applicability

The invention can be used in industry in the field of battery and accumulator manufacturing. The application therefore meets the requirement of PCT Article 33(4).

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.  
PCT/EP 00/05376

## VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

There is a typing error in line 3 on page 15 ("*Sauerstoffgatter*" should read "*Sauerstoffgetter*" [oxygen getter]).

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/EP 00/05376

## VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

In Claims 1 and 8, the term "higher" used to describe the C<sub>1</sub>-C<sub>3</sub> alcohols should be deleted, firstly because it is factually incorrect and secondly because it is redundant as a description of these alcohols (PCT Article 6).